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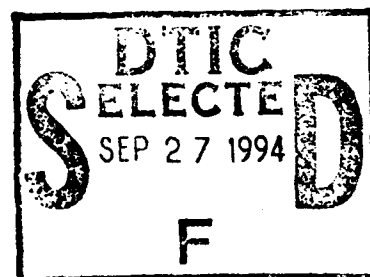
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"A Study of the Long Term Effect of the North American Free Trade Agreement on U.S. Investment in Mexico and the Resulting Impact on U.S. Exports to Mexico"



UNITED STATES NAVAL ACADEMY  
ANNAPOLIS, MARYLAND

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**"A Study of the Long Term Effect of the North American Free Trade Agreement on U.S. Investment in Mexico and the Resulting Impact on U.S. Exports to Mexico"**

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### Abstract

This paper is a study of the dynamic impact of the North American Free Trade Agreement (NAFTA) on U.S. foreign investment to Mexico and the level of U.S. exports to Mexico. A dynamic estimation is an estimation that accounts for decision making over time. The NAFTA decreases risk and leads to a large increase in U.S. investment to Mexico. As this investment increases, the Mexican economy will grow. As Mexicans income goes up, they will increase their level of imports. Since over 70% of Mexico's imports come from the U.S., U.S. exporters will benefit.

The dynamic effect of the NAFTA is estimated in two stages. First, an ordinary least squares regression equation is used to predict the level of U.S. investment under the NAFTA. The estimated value for U.S. investment to Mexico is entered into a computable general equilibrium (CGE) model to estimate the impact Mexico's growth will have on U.S. exports. This study finds that over the long term, the NAFTA is going to lead to a substantial increase in U.S. exports to Mexico.

Key Words: North American Free Trade Agreement, NAFTA,  
foreign investment

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## I) INTRODUCTION

On November 17, 1993, the North American Free Trade Agreement (NAFTA) passed both houses of Congress. During the period leading up to the vote, the agreement was intensely debated. Would the NAFTA create jobs, spur growth, and in general have a positive impact on the United States economy, or would it lead to a massive flow of U.S. jobs and capital to Mexico?

As the debate intensified, the arguments became more emotional and less scientific. Through the press, both sides made unfounded, outlandish predictions that generated more heat than light. For example, H. Ross Perot vocally proclaimed that the NAFTA would lead to a "mass sucking sound" of U.S. jobs fleeing to Mexico. There were many valid studies done on the subject. Although many of them never appeared on the front page of the newspaper, several were entered as testimony in the Congressional Hearings on the NAFTA.<sup>1</sup> This paper is based on some of these legitimate works and extends them from a static to a dynamic estimate.

The NAFTA debate began in 1989 when Mexico's President Salinas initiated talks with President Bush hoping that a free trade agreement with the United States would encourage a large increase in foreign investment in Mexico.

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<sup>1</sup>Among those presenting their work to Congress was Sherman Robinson, who was one of the primary authors of the CGE model used in this study, and Professor Karen Thierfelder, the faculty advisor for this project.

The Government of Mexico has been moving its economy towards free market enterprise. For example, during the two year period from 1988-89, they sold Cananea Copper, their two national airlines, shipyards, trucking, and various other firms for approximately US\$2.5 billion.<sup>2</sup> Selling the government controlled assets requires large amounts of private capital. Unfortunately for the Mexican Government, there is insufficient capital available in the Mexican economy to purchase the industries, ensure the restructuring of the Mexican economy, and maintain strong economic growth.<sup>3</sup> To get the required capital, the Government of Mexico must attract foreign investment.

Currently, the U.S. is the major foreign investor in Mexico. (See Chart Two.) In 1991, over 63% of foreign investment in Mexico came from the U.S.<sup>4</sup> The NAFTA contains investment reforms that ease restrictions placed on U.S. and Canadian investors and decrease the risk of nationalization that previously limited foreign investment in Mexico. Specifically, Article 1109 of the NAFTA guarantees that U.S. and Canadian investors will have all transfers and payments relating to their investment made without delay and in a

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<sup>2</sup>Latin America's Turn Around, Boeker, International Center for Economic Growth, San Francisco, CA. 1993; p 27.

<sup>3</sup>Latin America's Turn Around, Boeker, International Center for Economic Growth, San Francisco, CA. 1993, p 29.

<sup>4</sup>North American Free Trade Agreement, U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, p 73.

# Mexico's Imports By Country of Origin

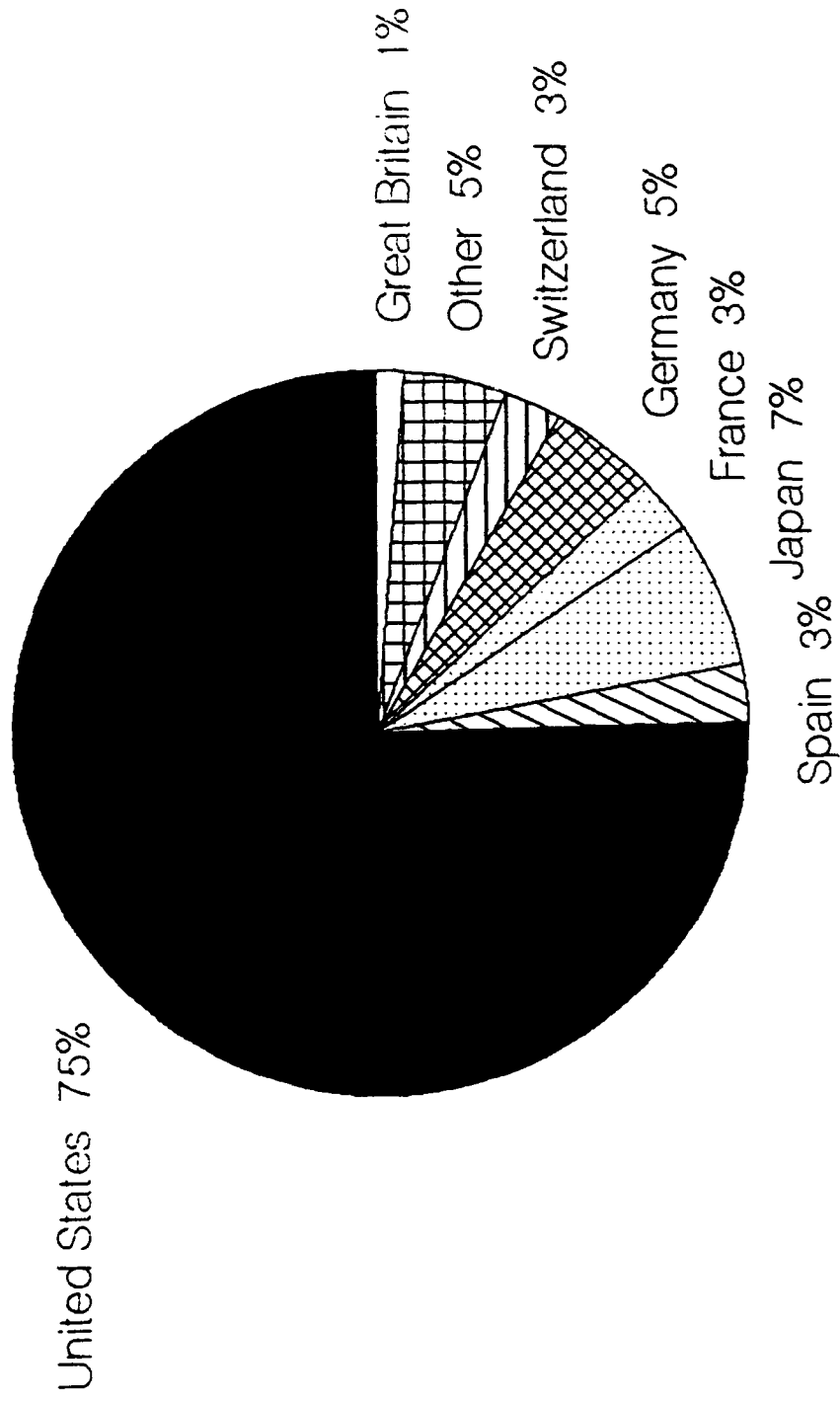
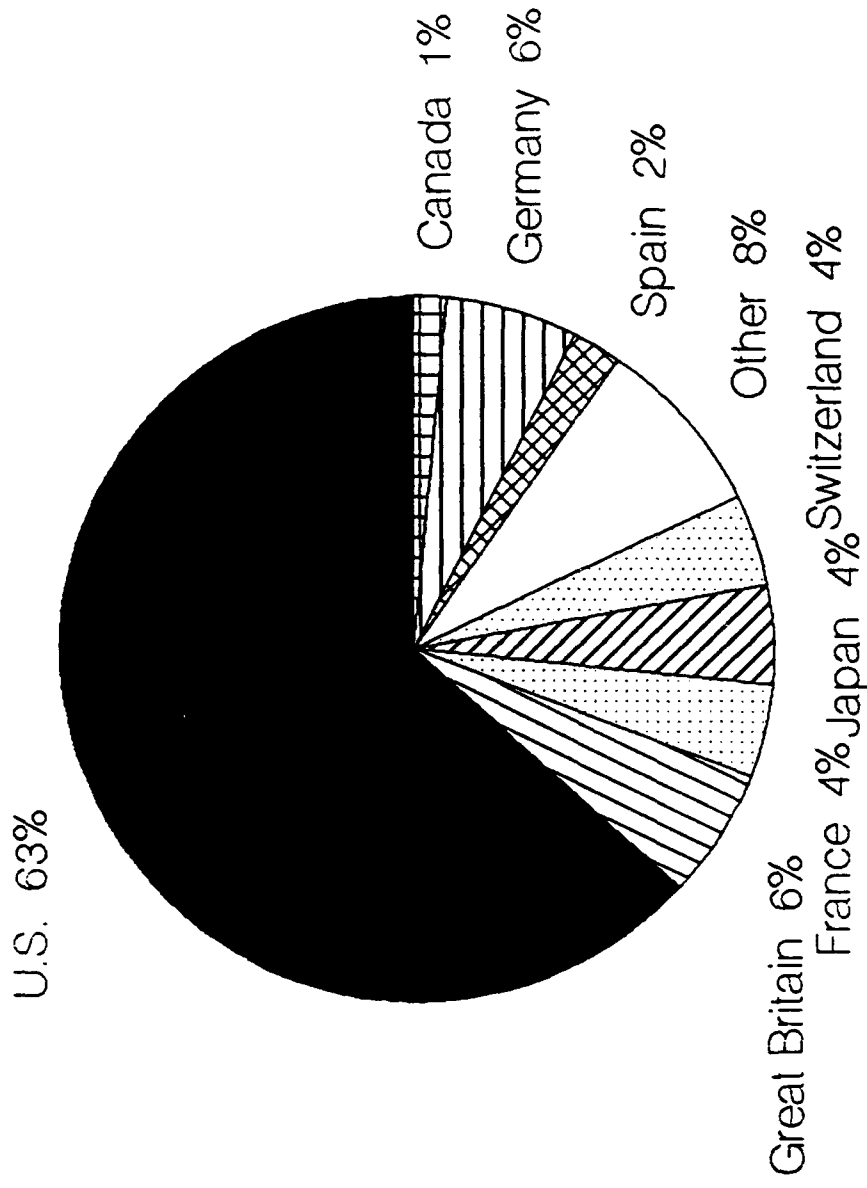


Chart One



# Foreign Investment in Mexico

## By Country of Origin



freely usable currency at the market rate of exchange.<sup>5</sup> The Mexican Government hopes these factors will combine to encourage a substantial increase in investment.

Many assume Mexico's gain in investment comes at the expense of the U.S. This is not likely to be the case. As Mexico's economy grows through increased foreign investment, the U.S. benefits from increased exports to Mexico. The U.S. is Mexico's most important trading partner. (See Chart One.) In 1991 over 75% of Mexican imports came from the U.S.<sup>6</sup> Since 1980, the U.S. has supplied at least 60% of Mexico's imports. Thus, policy changes that affect Mexico's economy will also influence the U.S.

The NAFTA creates two forces that increase the level of U.S. exports to Mexico. First, the reduction of tariffs and other trade barriers will reduce the price of U.S. goods in Mexico. The lower price leads to an increase in the demand for U.S. goods in Mexico. The tariff reduction will benefit the U.S. because before the NAFTA, Mexico's average tariff rate was just under 10% while the United States' was

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<sup>5</sup>"A Budgetary and Economic Analysis of the NAFTA, A CBO Study," The Congressional Budget Office, July 1993, p 109.

<sup>6</sup>North American Free Trade Agreement, U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, p 56.

slightly under four percent.<sup>7</sup> The majority of the work which assesses the impact of the NAFTA estimates this effect.<sup>8</sup> Tariff reduction alone leads to a small increase in U.S. exports to Mexico. Taking into account tariff reduction only, Adams, Alanis, and Beltran del Rio predict an increase in Mexican imports of about 60% over a ten year period. If tariff reduction were the only force influencing the trade flows between the U.S. and Mexico, then the U.S. would indeed experience small gains. However, these static studies exclude a large category of potential benefit. They estimate the impact of the NAFTA in the short term. In essence, they predict what would happen if the agreement was completely implemented today. They estimate the gains each country will experience based solely upon their comparative advantages. A more accurate prediction of the long term benefits requires one to account for the dynamic effects that occur in reaction to the NAFTA.

A dynamic prediction estimates the impact of the NAFTA over the long run. This type of estimate allows for changes in decision making. Specifically, it allows for an increase in foreign investment in Mexico. Short run estimates predict the effects of the NAFTA while assuming all factors

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<sup>7</sup>North American Free Trade Agreement, Annex 302.2, Schedule of the United States, Canada, and Mexico, U.S. Government Printing Office, Washington, 1993.

<sup>8</sup>See Koechlin, et al. (1991), Adams, Alanis, and Beltran del Rio (1992), Globerman (1992), Deardorff, Stern, and Brown (1991).

fixed. This is why a long term prediction is necessary to more precisely measure the impact of the NAFTA. As the level of foreign investment in Mexico increases, the Mexican economy will grow, raising the standard of living in Mexico. As Mexicans earn more, their consumption increases which leads to a rise in imports. Since the majority of Mexico's imports come from the U.S., the U.S. directly benefits from a stronger Mexican economy. This second force potentially has a much larger impact than the reduction of trade barriers.

This paper estimates the growth of the Mexican economy in response to the NAFTA. This will be done by estimating the increase in Mexico's capital stock. The change in capital stock will be approximated by predicting the level of U.S. investment in Mexico given the NAFTA. This change enables a dynamic estimate of U.S. exports to Mexico. This will be accomplished by entering the change in capital stock into a computable general equilibrium (CGE) model.<sup>9</sup>

## II) MEXICO'S TRADE AND INVESTMENT POLICY

Mexico has become more involved in international trade by both liberalizing trade restrictions and easing foreign investment restrictions. President Salinas has pushed the most recent efforts, leading Mexico to many reductions in trade and investment restrictions before proposing the

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<sup>9</sup>A full description of a CGE model is given in section IV.

NAFTA. Mexico's commitment to free trade has manifested itself in numerous ways: lower tariffs, the 1989 Foreign Investment Law, entering the General Agreement on Tariffs and Trade (GATT), and pursuing a free trade pact with the United States and Canada.

The Mexican Government began reducing trade restrictions in 1987, after becoming a member of the GATT in August of 1986. In December of 1987, tariffs were lowered from a maximum rate of 40 percent to one of 20 percent. The trade-weighted average tariff was reduced to 10.8 percent. Additionally, the Mexican Government eliminated the five percent export development tax, reduced the number of products subject to import permits, and discontinued the use of official prices for customs valuation purposes.<sup>10</sup> The Government of Mexico continued easing trade barriers, and the trade-weighted average tariff dropped to 9.5 percent in 1989.<sup>11</sup> These systematic reductions in trade restrictions have been accomplished much more rapidly than required under the terms of the GATT. This rapid trade liberalization demonstrates Mexico's desire to open their markets to free trade.

Mexico's trade liberalization has had a large impact on the balance of trade between the U.S. and Mexico. Since

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<sup>10</sup>"Mexico - Country Marketing plan for FY '94"; 1993 National Trade Data Bank, Market Reports, 15 September 1993; p 47.

<sup>11</sup>"Mexico - Country Marketing Plan FY '94"; 1993 National Trade Data Bank; 15 Sept. 1993, p 65.

Mexico began liberalizing trade restrictions, the level of U.S. exports to Mexico increased dramatically. In 1987 the U.S. had a \$4.1 billion trade deficit with Mexico. By 1989, for the first time since 1981, the U.S. had a trade surplus with Mexico.<sup>12</sup> Most recently, in 1992 exports from the U.S. to Mexico surged by 22 percent to \$40.6 billion. This outpaced import growth, and gave the U.S. a \$5.4 billion trade surplus with Mexico, only the second trade surplus in the past ten years.<sup>13</sup> In five years of Mexican trade liberalization, the U.S. has gained approximately \$10 billion in their balance of trade with Mexico.

Mexico is also gaining from the trade liberalization. When the Mexican Government decreases trade barriers, more foreign goods will come into Mexican markets. Mexican consumers will benefit from lower prices and better quality products. The increase in foreign participation in Mexican markets will also create more competition for Mexican firms. Increased competition leads to more efficient production, a better product, and lower prices.

While reducing tariffs and eliminating other non-tariff barriers is a big step in the direction of free trade, today's complex world market involves the flow of capital as

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<sup>12</sup>North American Free Trade Agreement, U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, pp 52 - 56.

<sup>13</sup>"Mexico - Country Marketing Plan FY '94"; 1993 National Trade Data Bank; 15 Sept. 93, p 52.

well as goods. Liberalization of both markets is necessary to attract foreign investment. This is why the Mexican Government has opened their capital markets to the rest of the world. Beginning in May of 1989, the Government of Mexico instituted a new foreign investment regulatory regime.<sup>14</sup> They made foreign investment easier in the *Maquiladora*, auto, insurance, banking, and mining industries.<sup>15</sup> Previously, foreign investment in Mexico was governed by the 1973 Foreign Investment Law, one of the most restrictive investment laws in the world. Foreigners were not allowed to buy a majority interest of an existing firm, if they owned the majority of a firm prior to 1973, they could not expand without selling equity to Mexicans. Foreigners could not own businesses in the most attractive sectors of Mexico's economy, including the petroleum and telecommunication industries.<sup>16</sup> These restrictions, combined with high inflation rates and exchange rate controls, led to low levels of foreign investment in Mexico. In 1980, the cumulative world-wide foreign direct investment in Mexico was \$8.4 billion. By the end of the decade, after the Mexican Government began to liberalize their capital

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<sup>14</sup>"Mexico - Country Marketing Plan FY '94", 1993 National Trade Data Bank, 15 September 1993; p 56.

<sup>15</sup>The *Maquiladora* industry is the U.S. sending partially finished products to Mexico to be completed. This is done to allow the U.S. access to Mexico's cheap labor force.

<sup>16</sup>Spotlight on Foreign Investment, 1993 National Trade Data Bank, Mexico, 19 February 1993, p 2.

markets, cumulative foreign direct investment reached \$30.3 billion.<sup>17</sup>

Mexico began to recognize the need to "re-privatize" many public entities in the early to mid 1980's when faced with strict budget constraints.<sup>18</sup> This process began initially with the Mexican Government selling to Mexican investors. However, they soon realized a need to attract external capital to operate some of the larger industries without governmental support.<sup>19</sup> The Mexican public pushed for more privatization after seeing the gains from free market enterprise. Thus, the Government of Mexico opened TELMEX, Mexico's telephone monopoly, to foreign investors. Since then, Mexico's government has actively encouraged foreign investment.

Attempting to encourage a marked increase in foreign investment is initially what led President Salinas to initiate the idea of a NAFTA.<sup>20</sup> The Salinas administration hopes that entering a free trade agreement with the U.S.

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<sup>17</sup>North American Free Trade Agreement, U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, p 74.

<sup>18</sup>Latin America's Turn Around, Paul H. Boeker, International Center for Economic Growth, San Fransico, CA. 1993; p 26.

<sup>19</sup>Latin America's Turn Around, Paul H. Boeker, International Center for Economic Growth, San Francisco, CA. 1993, p 28.

<sup>20</sup>Spotlight: Foreign Investment in Mexico, National Trade Data Bank, Mexico, February, 1993, p 1.



will signal the world that Mexico is committed to free trade. If Mexico does this successfully, the perceived risk involved in investing in Mexico will decrease. If foreigners feel the Mexican Government is supporting measures encouraging growth and supporting free trade, they will view Mexico as a more stable economic environment. As the level of risk decreases, the level of investment will increase.

After the NAFTA negotiations were completed, the Mexican Government rewrote the 1989 investment regulations and parts of the 1973 Foreign Investment Law. The new legislation will be patterned after the investment chapter of the NAFTA. The most important section of the investment chapter is Article 1109. It requires each party to the agreement to "permit all transfers and international payments relating to an investment freely and without delay, in a freely usable currency at the prevailing market exchange rate."<sup>21</sup> This greatly reduces the risk of investing abroad because the foreign investor is guaranteed the same rights as the domestic investor.

### III) INVESTMENT IN MEXICO

For Mexico, the largest impact of the NAFTA is most likely going to be a strong surge in foreign investment. A

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<sup>21</sup>"A Budgetary and Economic Analysis of the NAFTA, A CBO Study", The Congressional Budget Office, July 1993, p 110.

sharp increase in foreign investment will have a big effect on a small Mexican economy that received only \$33.8 billion of cumulative foreign investment as of 1991.<sup>22</sup> Investment into Mexico enters through the stock market (portfolio investment), as foreign investment or as foreign direct investment.

Portfolio investment includes the Mexican stock market, mutual funds, bonds, and Ordinary Participation Certificates (CPO's). A CPO allows a foreigner to purchase shares of stock in a Mexican company that was previously restricted to Mexican investors. The foreign investor surrenders the voting rights that accompany the share of stock, but they keep the financial rights via the CPO.<sup>23</sup> The introduction of the CPO's has encouraged foreign participation in the Mexican stock market, and as of September, 1990 investment through neutral trust mechanisms reached U.S.\$535.5 million. This accounted for 16.7% of the total foreign investment in Mexico.<sup>24</sup> Since the level of foreign participation has already shown a marked increase because of the creation of CPO's, the NAFTA's investment

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<sup>22</sup>North American Free Trade Agreement: U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1993, p 73.

<sup>23</sup>Spotlight: Investment in Mexico, National Trade Data Bank, Mexico, February, 1993, p 4.

<sup>24</sup>Spotlight: Investment in Mexico, National Trade Data Bank, Mexico, February, 1993, p 4.

provisions are not likely to have a major impact on the Mexican stock market.

Instead, there will be substantial changes in the other types of foreign investment. Foreign direct investment involves the full or partial ownership and control of a Mexican firm.<sup>25</sup> The U.S. presents a strong case for the importance of foreign direct investment to economic growth. In the late 1960's two percent of worldwide foreign direct investment went to the U.S., by the 1980's this level rose to 40%.<sup>26</sup> Over this same period of time, the U.S. sustained a strong, steady upward trend in Gross Domestic Product (GDP). It is doubtful that this level of growth would have been obtainable without the influx of foreign capital. Likewise, the Mexican Government anticipates direct investment led growth. They hope foreigners will invest strongly in Mexican industry. This will supply Mexican firms with the capital necessary to become more efficient and, therefore, more competitive on the world market.

Lastly, the NAFTA will have an impact on foreign investment in Mexico. This is the relocation of existing foreign firms to Mexico in order to make better use of the

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<sup>25</sup>"Explaining Interstate Variations in Foreign Direct Investment in the United States," Kozlowski and Weekly, 1990, p 1.

<sup>26</sup>"Explaining Interstate Variations In Foreign Direct Investment in the United States," Kozlowski and Weekly, 1990, p 1.

resources there and to gain access to the local markets. The difference between direct investment and this investment is that direct investment involves purchasing existing firms. This form of investment was a contentious issue in the NAFTA debate. Opponents claimed that once the NAFTA is implemented, U.S. firms would line up to relocate to Mexico. They maintain that because of the lower wage rates in Mexico, many U.S. firms will move to Mexico in order to take advantage of cheap labor. While the wage rate in Mexico is lower, the term "cheap labor" is a misnomer. Firms will not make relocation decisions based solely on the wage rate. They will consider a measure of labor cost. The cost of labor is a factor of the wage rate and labor productivity. A firm will benefit from low wage rates only if they are coupled with high productivity values. Mexico's labor productivity is much lower than the United States'. The low productivity cancels some of the attractiveness of Mexico's low wage rate.

If U.S. firms could supply U.S. markets, tariff-free, from Mexico, and have lower production costs, there will certainly be instances of firms relocating to Mexico. However, the opposite may also occur. There were many U.S. firms operating in Mexico pre-NAFTA, and many of them located in Mexico to be closer to their markets and to avoid high Mexican import tariffs. This is particularly evident in the auto and auto parts industries, who suffer from some

of Mexico's most restrictive import laws. Many of these firms, particularly the capital intensive ones, can produce at a lower cost in the United States. They elected to produce in Mexico to avoid high tariffs, which raised the price to Mexicans and decreased the demand for their product. The elimination of the high tariffs these firms were facing gives them a reason to return their production to the U.S. Plant relocation is likely to occur in both directions, and it is difficult to determine which effect will dominate.

While the pattern of foreign investment is a subject for debate, both sides agree on how the NAFTA will stimulate direct investment into Mexico. There is a consensus that combining an easing of Mexico's previously strict investment laws with the decreased risk introduced by the NAFTA will cause foreign investors to take a very active role in Mexico. Many feel that it will be an extension of the rapid increases in foreign investment that have been occurring since the Mexican government eased their investment restrictions in the late 1980's. In 1986, the year the first strong steps were taken to liberalize investment regulations, the cumulative foreign direct investment in Mexico was \$17 billion.<sup>27</sup> In 1989, the year the Mexican Government rewrote their investment laws, foreign direct

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<sup>27</sup>North American Free Trade Agreement, U.S.-Mexican trade and Investment data, United States General Accounting Office, Sept. 1992, p 76.

investment reached \$26.6 billion, and by 1991 cumulative investment reached \$33.8 billion.<sup>28</sup> This was a nearly one hundred percent increase in five years. The NAFTA carries these steps further along the path towards complete freedom in the capital market between Mexico, Canada, and the U.S. In 1991, the U.S. accounted for 67% of the cumulative foreign direct investment in Mexico, and Canada for 2.1%.<sup>29</sup> By opening their capital markets to investors from these two countries, Mexico stands to see substantial increases in foreign investment.

Nations outside of the agreement will likely increase their level of investment into Mexico as well. This will occur for a variety of reasons. Primarily, as the Mexican economy grows, the rate of return on investments will increase. Higher returns will signal the rest of the world to invest in Mexico. Countries not directly involved in the NAFTA will invest more in Mexico because they stand to earn higher profits than elsewhere.

The model developed in this paper will estimate the increase in foreign direct investment to Mexico following the NAFTA. Foreign investment will flow strongest to those

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<sup>28</sup>North American Free Trade Agreement, U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, p 76.

<sup>29</sup>North American Free Trade Agreement, U.S.-Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, p 76.

areas where the chances for profit are the greatest. With the Mexican Government taking strong steps to develop their country, it is likely that the industries such as communications, construction, and energy production are going to see the most rapid increase in direct investment.<sup>30</sup>

#### IV) MODELING

##### A) DEVELOPING THE MODEL

There are two broad classes of models used to analyze the NAFTA and the effects of foreign direct investment. Regression studies use a series of data to predict changes. On a broader scale, macro simulation models estimate the impact of changing conditions on a system of equations. Finally, comparative static models use a single data point to simulate an economy. In this analysis, I will combine elements of regression models and comparative static models.

Macro simulation models offer predictions of the impacts of the NAFTA on macroeconomic variables such as unemployment, trade deficits, and inflation. They also tend to be inherently dynamic because they make very precise short term estimates of the movements of variables.<sup>31</sup> Some examples of this type of modeling are Adams and Beltran del

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<sup>30</sup>Latin America's Turn Around, Paul H. Boeker, International Center for Economic Growth, San Francisco, CA, 1993, p 61.

<sup>31</sup>"A Budgetary and Economic Analysis of the North American Free Trade Agreement," A CBO Study, July, 1993. p 114

Rio (1992) and the McKibbin-Sachs Global (MSG) model, which was used recently by the Congressional Budget Office in a study of the impact of the NAFTA.

Adams and Beltran del Rio use a version of the Ciemex model of Mexico. This model was first developed by Beltran del Rio in 1973 and consists of 98 behavioral equations with coefficients estimated using data from 1970 - 1986.<sup>32</sup> These equations describe the Mexican economy from a broad based macroeconomic perspective. The authors project a baseline simulation of the Mexican economy without the NAFTA. They then change the model to simulate the major provisions of the agreement. The drawback to this model is that changes to important variables, such as foreign investment can not be measured. The authors make assumptions about the changes of these variables and use them to make their estimates. This means that the authors are simulate the effects of the changes in investment by using an ad hoc measure of the change in foreign investment. The MSG model is designed to look at global macroeconomic issues and is consistent in analyzing certain dynamic effects. However, because this model has a strong foundation in macroeconomics, it is poor at making microeconomic predictions. The lack of microeconomic theory in this models results in inaccurate estimates of the effects of government policy changes, such

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<sup>32</sup>"The Mexico - United States Free Trade and Investment Area Proposal: A Macroeconometric Evaluation of Impacts on Mexico," F. Gerard Adams and Abel Beltran del Rio, Journal of Policy Modeling, vol 14, 1992, p106.



as trade and investment liberalization. While the MSG model is better than most macro models in measuring these effects, it does not do a good job of reflecting the characteristics of Mexico's labor market.<sup>33</sup> Predicting the effects of the NAFTA on Mexico's labor force is important because how the agreement impacts the Mexican workers will directly effect the amount of U.S. goods sold to Mexico.

Single equation regression models are used to make predictions based on either historical or cross-sectional data. Koechlin, et al. (1991) and Taveria (1986), construct models in which foreign investment is a function of market size, production costs, and political risk. While these models make more accurate predictions of the impact of policy changes, they do not take into consideration the dynamic impacts involved with changing policies or the interaction between sectors of the economy. Regression models estimate the impact of individual factors upon the dependent variable. Predictions are made by assigning values to the independent variables and calculating the value of the dependent variable. If the changing conditions have a strong multiplier effect throughout the economy, a simple regression equation will be limited in its ability to capture all of these affects.

The NAFTA will have many direct and indirect influences

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<sup>33</sup>"A Budgetary and Economic Analysis of the North American Free Trade Agreement," A CBO Study, July 1993. p. 116

on the Mexican economy. As the level of investment in Mexico increases, the production capabilities will also increase. Increased investment will also change wage rates, employment, and consumer spending. The many changes, coupled with the long period of time over which the NAFTA takes effect, makes it difficult for a single equation regression model to accurately measure the long term impact of the agreement on U.S. - Mexico trade patterns.

The model developed for this paper is an extension of a single equation regression model. It utilizes a regression equation to determine the impact of the NAFTA on U.S. foreign investment to Mexico. Once the coefficients have been estimated, the equation will be used to predict the level of Mexican capital stock when the NAFTA has been fully implemented. Then, the level of capital stock will be entered into a CGE model. With this approach, one obtains a more dynamic estimate than in the other models discussed in this paper. The level of capital stock entered into the CGE model is a prediction of the level of foreign investment into Mexico once the NAFTA is fully implemented. This policy shock simulates dynamic responses throughout the Mexican economy. This will enable the model to more accurately estimate the long term gains of trade to be realized by the U.S.

Koechlin, et al. model investment as a function of market size, operating costs, and the political risks

associated with investing in a foreign country. Their model uses aggregate foreign direct investment from the U.S. to the host country as the dependent variable, and gross domestic product, average wage rate divided by an index of labor quality, tax rate, the distance of the host country's capital from New York City, and a political risk index as the independent variables.<sup>34</sup> They also use dummy variables for whether or not the country speaks English, is a Latin American nation, or is a member of the European Economic Community (EEC). In their regression, the authors use a series of aggregate U.S. FDI into 23 different countries.

The authors change the coefficients of the dummy variable EEC and the BERI index to estimate how U.S. investment to Mexico is going to be affected by the NAFTA. The value of the EEC coefficient is used to create what the authors call the "common market effect." This is their estimation of how entering into a common free trade market will effect foreign investment.

The value of the BERI coefficient is used because one of the most important impacts the NAFTA will have on Mexico is reducing the risk involved in doing business there. Mexico has had a history of political and economic instability. An example of this would be when the Mexican Government devalued their currency in 1982. This was done

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<sup>34</sup>The BERI, an index created by an independent research firm, is a measure of the political risk involved in doing business in a foreign country.

to help finance Mexico's budget deficit, but it led to an over expansion of the money supply and many foreign investors lost money.<sup>35</sup> This instability creates a risky environment for investors. There are many implicit costs to physical investment in a foreign country, such as constructing a plant, training a work force, and creating a market. If a sizeable investment project must be abandoned, the company making the investment can not regain the money they lost. The perceived level of risk of investing in the host country will directly impact a firm's willingness to undertake a large project abroad. As the level of risk increases, investors must be compensated with a higher rate of return on their investment. Mexico has been reducing the risk of foreign investment by liberalizing investment laws, decreasing trade barriers, and privatizing many industries. The NAFTA will guarantee that Mexico continues with this action. It is critical for the Mexican Government to lower the perceived risk level to encourage more foreign investment.

Koechlin, et al., use the values of the BERI and EEC coefficient to estimate an eight year cumulative investment growth of between \$26.7 and \$31.3 billion from the U.S. to Mexico. These conclusions are reached by predicting a ten percent increase in the BERI index and using what the

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<sup>35</sup>Mexico's Search for a New Investment Strategy, Dwight S. Brothers and Adele E. Wick, eds., Westview Press, Boulder, 1990 p 11.

authors call a "common market effect."<sup>36</sup>

The basis for the common market effect is that the Koechlin, et al. model estimates that being a member of the EEC increases the predicted level of foreign investment into that member country by a factor of 2.45. The authors assume that this common market effect will have the same impact upon Mexico once the NAFTA takes effect. The prediction of the impact on a member of the EEC is credible, but there is not a strong enough relationship between the NAFTA and the EEC to assume equal effects. First, the EEC is a common market while the NAFTA is purely a trade agreement. Second, since the U.S. is not a member of the EEC but is one of the parties in the NAFTA, the impact of the two types of regional trading areas on U.S. investment are likely to be different.

By dividing their FDI estimates by a capital-labor estimate, the authors predict a decline of 290,00 - 490,000 U.S. jobs. They feel this will occur because of firms relocating to Mexico to employ cheap labor and foreign countries relocating their direct investment from the U.S. to Mexico. In this estimate, the authors feel that production in Mexico is cheaper because the labor costs are lower. While this may be true in some labor intensive industries, it will not hold true for many other firms.

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<sup>36</sup>An increase of the BERI index means more political stability and therefore lower risk.

The model created by Taveria (1986) also attempts to predict the effect a free trade agreement would have upon the level of investment in a less developed country. Unlike the Koechlin, et al. model, this model does not use time-series or aggregate investment data. Instead, Taveria uses U.S. investment data across industries as well as across 37 countries. This model was developed to determine the effects of EEC membership on foreign direct investment in Portugal. As is the case with many of the models predicting foreign direct investment, this one uses independent variables that control for market size, costs, and the economic-political environment. This model is a multiple regression model with U.S. foreign direct investment as the dependent variable and population, per capita gross domestic product (PGDP), wages, energy consumption, distance between the host country's harbor and a major U.S. port, GDP, primary exports as a percentage of total exports, tax burden, education, efficiency wages, investment incentives, and investment risk as the independent variables.

Interestingly enough, Taveria concludes that there would be a minimal increase in U.S. foreign direct investment in Portugal after the nation joined the European Community.<sup>37</sup> This is not likely to be the case with U.S. investment to Mexico. Before they joined the EEC, Portugal

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<sup>37</sup>"Portugal Accession to the EEC" - Elisa M. Ferreira Taveria (1981) p 25.

had few impediments upon outside investment. Because markets are forward-looking, any investment Portugal would attract by joining the EEC would already have been in place before they became a member.

This will not be the case with U.S. direct investment to Mexico for two reasons. First, even with recent liberalization in their investment laws, Mexico still had some of the most restrictive investment laws in the world.<sup>38</sup> Until the NAFTA and its provisions for the changes in investment laws, Mexico limited the industries in which outsiders could invest, the amount of control they could take in a Mexican industry, and the amount that could be invested without approval from the Mexican government. These restrictive laws acted to deter investment in Mexico. Furthermore, the trade environment, from the U.S. perspective, is different. The U.S. is a vital member of the free trade agreement but is not a member of the European Economic Community.

## **B) THE MODEL**

The model is:

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<sup>38</sup>See Chapter three for a more detailed explanation of Mexico's investment laws.

$$\ln KDI = \alpha + \beta_1 \ln PGDP + \beta_2 \ln WAGE + \beta_3 \ln TAX + \beta_4 \ln TARIFF \\ + \beta_5 \ln IRATE + \beta_6 \ln BERI + e \quad (1)$$

OLS regression is used to estimate investment changes in Mexico.

The data are a time-series from 1970 to 1992. The dependent variable, *KDI*, is calculated as the net book value of U.S. investors' equity in and outstanding loans to foreign affiliates.<sup>39</sup> The model focuses on U.S. investment because in recent years, U.S. investment has comprised approximately 60 - 70% of the total foreign investment in Mexico.<sup>40</sup> *PGDP* is Mexico's per capita gross domestic product and is included to account for the current productive capacity of the host country. This variable is expected to have a positive influence on foreign investment because as Mexico's economy grows, it requires more capital, some of which will come from abroad. Also, as the economy grows it creates a more lucrative market which also attracts increased capital.

*WAGE* is an index of the average wage rate of non-agricultural workers in Mexico. This is included to control

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<sup>39</sup>Data sources are listed in Appendix One.

<sup>40</sup>North American Free Trade Agreement, U.S. - Mexican Trade and Investment Data, United States General Accounting Office, Sept. 1992, p 73.



for the effects of "cheap" Mexican labor on the level of investment. If firms perceive labor to be cheaper in Mexico, *WAGE* should have a negative effect upon investment. As the wage level increases, firms that are attracted to Mexico because of cheap labor will be discouraged. This will lead to a decrease in foreign investment. Since firms investment decisions are driven by labor costs, not wage rates, this effect would be captured more completely with a measure of labor productivity. Unfortunately, a measure of this productivity is not available.

*TAX* is Mexico's effective tax rate on production. Taxes decrease profits; therefore they should have a negative impact upon the level of foreign investment.

*TARIFF* is the trade weighted average Mexican tariff rate. There are two schools of thought on the impact of trade barriers on investment. One is that larger values for *TARIFF* should increase foreign investment. As tariffs are lowered, markets become more accessible. This removes the incentive for some firms to operate in Mexico. If they can produce in the U.S. and sell their goods in Mexico without facing a large import tariff, they can produce in the U.S. at a lower cost and maintain their sales level by avoiding high tariffs. The other philosophy is that trade and investment are closely related. Therefore, high trade barriers also lead to lower amounts of foreign investment.

*IRATE* is Mexico's interest rate. It is expected to

have a positive coefficient. Higher interest rates attract more foreign investors because they enable investors to earn larger profits.

The *BERI* is a measure of political risk. *BERI* (Business Environment Risk Intelligence) is an index that measures the political and economic risk of doing business in a foreign country. The index is a composite of assessments of political continuity, attitude toward foreign investors, and degree of nationalization. It also includes economic characteristics such as inflation, growth, and balance of payments and policy characteristics such as size of bureaucracy, currency convertibility, and contract enforceability. An increase in this index relates to an improvement in the political situation. The firm that creates this index, *BERI, S.A.*, specializes in advising banks and companies with operations in foreign countries. The *BERI* index is included to capture the political impact of the NAFTA. It is expected to have a positive effect on investment. As the political risk involved in investing abroad decreases, the acceptable rate of return is lower. This means that firms will be more likely to invest abroad for lower but more certain profits. This will increase the amount of foreign investment.

Other variables were considered in the analysis but ultimately were excluded from the final equation. In addition to the variables in this model, measures of

Mexico's exchange rate and value added were considered in earlier versions of the model. The exchange rate was considered because it affects the cost of investing in Mexico. An increase in the dollar's value against the peso means that U.S. investors can purchase more capital in Mexico for the same number of dollars. Value added is the value of finished goods less the amount paid to intermediates and taxes. In essence, it is the payment to the primary factors, land, labor, and capital. This was initially considered to control for Mexico's productivity. An increase in value added reflects an increase in production and will attract more foreign investment. Attempting to include these additional variables in the equation led to difficulty. When this regression equation was estimated none of the coefficients were statistically significant, the R-Squared (adj) was .8372, and the F-Statistic was 18.5, which is statistically significant at the one percent level. (See Table One.)

There are a couple of reasons to exclude the exchange rate from the model. First, Mexico fixed the peso to dollar exchange rate from 1934 until 1976. During this period, it contributes nothing to the regression model because there is no variation to the variable. Additional error arises over the last ten observations as well. In 1982 in order to help pay off foreign debts, the Mexican Government devalued their currency. When this occurred, Mexico's exchange rate rose

TABLE ONE - REGRESSION RESULTS

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<u>Variable</u>	<u>Coefficient</u>	<u>T-Ratio</u>
PGDP	3.05860	1.940
WAGE	-0.80634	-1.333
TAX	-0.08600	-0.167
TARIFF	-0.53245	-0.375
XRATE	-0.66100	-0.473
IRATE	-1.30140	-0.896
VALADD	0.61552	1.469
BERI	-1.30140	-0.745
R-Squared	0.885088	
R-Squared(ADJ)	0.837209	
Sum of Squares of Errors	1.130795	
F [9,13]	18.48566	

Note: The coefficients are the elasticities of the variable. They represent the percent change in the dependent variable that results in a one percent change in the independent variable. For example, a one increase in PGDP will lead to a 3.058 percent increase in U.S. investment.

The T-Ratio is the value of the coefficient divided by the standard error of the variable. This value is used to test for the statistical significance of the variables in the equation.

R-Squared is the fraction of the variation in the dependent variable that can be explained by the regression equation.

R-Squared (adjusted) takes into account the degrees of freedom in the equation. Any variables added to the equation will increase R-Squared. R-Squared (adj) takes this into account, and will only increase when a variable, which increases the explanation, is added to the equation.

from slightly more than 23 pesos to 148.5 new pesos to the dollar. This change coupled with the fixed exchange rate introduces substantial error into the regression equations containing an exchange rate variable. However, after eliminating this variable the regression equation did not improve substantially. The R-Squared (adj) rose slightly to .8792, and only three of the seven independent variables were significant.

After eliminating the exchange rate the model is still exhibiting a poor fit. This is because of the existence of multicollinearity: a strong relationship between independent variables. If a nearly linear relationship exists between independent variables, the standard errors of variables will be overstated. Large standard errors imply that sampling variability is high, the interval estimates of the slope coefficients are wide, and the information provided by the sample data is relatively imprecise.<sup>41</sup> There are two ways to detect multicollinearity. An auxiliary regression equation can be run with one of the independent variables as the dependent variable. Then the R-Squared and the sum of squared errors can be examined to determine the collinear relationship between the variables. The second and more commonly used method is to calculate a correlation matrix for the variables. A correlation coefficient greater than

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<sup>41</sup>Learning and Practicing Econometrics, William E. Griffiths, R. Carter Hill, and George G. Judge, John Wiley and Sons, Inc., New York, NY. 1993, p 435.

0.8 indicates a strong linear relationship.<sup>42</sup>

To further examine the variables, a correlation matrix of the independent variables is constructed. This matrix represents the colinearity between the variables. This matrix shows a very strong relationship between the variables WAGE, TAX, TARIFF, IRATE, and VALADD. This strong correlation indicates that the model is fraught with multicollinearity.

In order to determine which of these variables is negatively impacting the model, a step regression is performed. This type of regression estimates the equation and then calculates the effects of each additional variable on the regression. Specifically, this regression form gives the impact the additional variable have on R-Squared. This version is used to test the individual impact of the collinear variables WAGE, TAX, IRATE, and VALADD. TARIFF is not considered in this step because this variable was a necessary piece of the regression equation.

Three of the four variables tested have a significant impact upon the equation's R-Squared. (See Table Two.) IRATE has the strongest effect. The value for the partial-R-Squared is .39214. This means that if the dependant variable were to be regressed against IRATE only, the R-Squared would be .39214. WAGE and TAX have values of .01465

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<sup>42</sup>Learning and Practicing Econometrics, William E. Griffiths, R. Carter Hill, and George G. Judge, Wiley and Sons, Inc, New York, NY. 1993; p 436.

TABLE TWO - STEP REGRESSION RESULTS

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<u>Variable</u>	<u>Change in R<sup>2</sup></u>	<u>Partial R<sup>2</sup></u>
IRATE	0.032497	0.39214
VALADD	0.000018	0.00214
TAX	0.001594	0.03067
WAGE	0.000745	0.01465

Note: The Change in R-Squared is how much of an impact the variable will have on the equation's R-Squared. It is important to remember that R-Squared will always increase as additional variables are added.

The Partial R-Squared is the correlation of the dependent variable with this variable. It is what the R-Squared would be if this were the only variable in the equation.

and .03067 respectively. VALADD has the smallest partial R-Squared with a .00214. Since VALADD has such a small impact on the explanatory power of the regression equation, the multicollinearity it introduces to the equation outweighs its benefits. Therefore, the variable VALADD is eliminated from the original regression equation.

The results of a Box-Cox test indicate a log-linear equation should be used to estimate the relationship between foreign direct investment and the independent variables.<sup>43</sup> This test compares the sum of squared errors of a log-linear equation ( $SSE_{\ln}$ ) with those of a linear-linear equation ( $SSE_1$ ). The functional form with the lower SSE is more appropriate for the analysis. In order to make this comparison, the sum of squared errors must have the same magnitude. This is accomplished by taking the log of  $SSE_1$  divided by the geometric mean of the dependent variable. In this instance,  $SSE_{\ln} = 3.9946 \text{ E}^{10}$  and the transformed  $SSE_1 = 8.14 \text{ E}^{10}$ . Since  $SSE_{\ln}$  is the lower value, the log-linear form is the form chosen for this regression equation.<sup>44</sup>

The regression results differ from expectations. (See Table Three.) In general, the usefulness of the regression equation is determined by the significance of the

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<sup>43</sup>For a complete explanation on the Box-Cox test see Introduction to Econometrics by G.S. Maddala (1992)

<sup>44</sup>The log-linear functional form is also the form used in Koehlin, et al. (1991) and Taveria (1983).



TABLE THREE - REGRESSION RESULTS

<u>VARIABLE</u>	<u>COEFFICIENT</u>	<u>T-RATIO</u>
PGDP	1.3741	0.456
WAGE	-0.116	-0.215
TAX	-0.4777	-1.027
TARIFF	-1.0887	-0.947
IRATE	-0.3094	-3.280
BERI	1.5971	1.561
R-Squared	0.9590196	
R-Squared (ADJ)	0.9398954	
Sum of Squares of Errors	0.8098954	
F [7,15]	37.61729	
Durbin-Watson	2.1002215	
D <sub>L</sub>	0.389	
D <sub>u</sub>	2.572	

Note: The coefficient is the elasticity the variable.  
It equals the percent change of the dependent variable  
for a one percent change in the independent variable.  
For example, a one percent increase in the BERI will  
increase investment by 1.5971%.

The T-Ratio is the value of the coefficient divided by  
the standard error of the variable. This value is  
used to test for the statistical significance of the  
variable in the regression equation. A value greater  
than 1.24 indicates that the coefficient is  
significant at the 10% level.

The R-Squared is the variation in the dependent  
variable explained by the regression equation.

R-Squared (adjusted) takes into account the degrees  
of freedom in the equation. Any variable added to the  
equation will increase R-Squared. R-Squared (adj)  
takes this into account and will only increase when an  
explanatory variable is added to the equation.

The F-Statistic is significant at the one percent  
level.

coefficients and the overall fit of the equation. Each coefficient is tested to determine if it is significantly different from zero. If the coefficient is insignificant, then the variable does not have a strong impact upon the dependent variable. The coefficients of *PGDP* and *BERI* are both positive as expected, but neither variable is statistically significant from zero at the 10 percent level of significance.<sup>45</sup>

The coefficients for *IRATE* and *TARIFF* are both negative. A positive value was expected for *IRATE*. This difference could be because Mexico's nominal interest rate was used in the equation. Ideally, Mexico's real interest rate would have been used. The nominal interest rate, unlike the real interest rate, is effected by inflation. The effects of the inflation rate could be responsible for the negative coefficient. The negative value for *TARIFF* demonstrates that in the case of U.S. - Mexico trade, high trade barriers discourage foreign investment. *TARIFF* is insignificant while *IRATE* is significant at the one percent level.

*WAGE* and *TAX* both have negative coefficients as expected, but neither is significant. The reason for this is most likely because of multicollinearity. These two variables are nearly perfectly correlated with one another.

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<sup>45</sup>The lower the significance level, the more likely the coefficient is different from zero. A 10% level means the variable is 90% likely to be different from zero.

The entire regression equation exhibits the classical case multicollinearity. The evidence of this is the R-squared term is .959 while only three variables in the equation were significant.<sup>46</sup> Furthermore, the F-test, which is a measure of how well the entire equation explains the variation in the dependent variable, shows that the equation is significant at the one percent level. The F-statistic is 37.6 which is much greater than the F-critical value of 4.28. Additionally, the linear relationship between some of the independent variables can be seen in the correlation matrix. (See Table four for a correlation matrix of the independent variables.) Several of the independent variables are highly correlated. The wage and tax variables are almost perfectly correlated. The same is true of the interest rate and the tariff level. Each pair has a correlation coefficient of 0.99. The latter two are also highly correlated with the former, as all four variables have a correlation greater than .80. A strong relationship exists between the variables and time as well. This is controlled for by detrending the data, including a variable for the year in the regression equation.

There are two possible ways to limit the effects of multicollinearity upon the regression. One is to expand the data set. There is a combination of difficulties that

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<sup>46</sup>R-squared tells how accurate the regression is. The closer the value is to one, the better the regression.

TABLE FOUR - CORRELATION MATRIX

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VARIABLE	YEAR	FI	PGDP	WAGE	TAX	TARIFF	IRATE	BERI
YEAR	1.00	.71	.72	.75	.74	-.95	.93	-.57
FI	.71	1.00	.51	.76	.75	-.66	.65	-.15
PGDP	.73	.51	1.00	.24	.24	-.50	.46	-.15
WAGE	.75	.73	.24	1.00	.99	-.83	.84	-.35
TAX	.74	.75	.23	.99	1.00	-.82	.83	-.35
TARIFF	-.95	-.66	-.50	-.83	-.82	1.00	-.99	.63
IRATE	.93	.65	.46	.83	.83	-.99	1.00	-.63
BERI	-.57	-.15	-.15	-.35	-.35	.63	-.63	1.00

Note: The values in the matrix are the relationship of the variable in the row with the variable in the column. The closer the value to one, the stronger the correlation between the variables. For example, there is a very strong correlation between WAGE and TAX.

constrained the data set. The BERI index limited the data set as it is only available from 1970. Further restricting the data set, the BERI index, interest rate, and average tariff rate are available only on an annual basis, although the other variables are available quarterly. The smaller the data set, the more problems there will be with the regression. Small data sets do not offer many observations for the computer to use when calculating coefficients. This results in imprecise estimations of the slope coefficients and makes the equation more susceptible to regression problems such as multicollinearity.

Multicollinearity can also be controlled by eliminating some of the highly collinear variables. This proves difficult in this case because over half of the independent variables are strongly related. This relationship between the independent variables makes it difficult to pinpoint which one is responsible for the variation in the dependent variable. In this case, the high collinearity between the interest rate and the tariff rate makes it impossible to determine which variable leads to the variation in the level of investment.

A second common problem with time series data is autocorrelation. This exists when the error terms are correlated.<sup>47</sup> The test for autocorrelation is to compare

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<sup>47</sup>An OLS regression assumes the error terms are independent from one another. If they are not, the OLS estimators will be imprecise and inefficient.

the Durbin-Watson statistic to the critical values that are dependent upon the number of observations and independent variables in the equation. In this case, the Durbin-Watson value is 2.1, the critical values are 0.447 and 2.472, and the probability of autocorrelation is 0.05. If the Durbin-Watson statistic falls between the critical values, the test to determine the existence of autocorrelation is inconclusive. The general assumption, however, is that the closer the Durbin-Watson value is to 2.0, the less likely autocorrelation.<sup>48</sup> The Durbin-Watson being nearly equal to 2.0 and the low probability show that autocorrelation is not a significant problem in this model.

The NAFTA is going to affect investment in two ways. First, tariff rates are going to change between the nations in the agreement, eventually decreasing to zero in most sectors. To simulate this effect on investment, the value for *TARIFF* will be decreased to zero. Second, political risk involved in investing in Mexico will decline considerably following the NAFTA because of a change in Mexico's investment laws. Therefore the *BERI* index will increase. In the estimate, the index will be increased 10% over its 1992 value. A 10% increase is used because when Mexico devalued their currency in 1982 causing foreign investors to lose money, the *BERI* index decreased 10%. The

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<sup>48</sup>Learning and Practicing Econometrics, William E. Griffiths, R. Carter Hall, and George G. Judge, John Wiley and Sons, Inc., New York, NY. 1993, p 530.

NAFTA is expected to have at least as large of an impact as did this policy change. Once the coefficients are calculated for the independent variables, the levels of *TARIFF* and *BERI* will be changed to represent the full impact of the NAFTA. Combining these new values with the coefficients from the regression equation will forecast U.S. foreign investment into Mexico following the NAFTA.

The coefficient of the *BERI* is 1.5971 and the one for *TARIFF* is -1.0887. This means that a one percent increase in the *BERI* index will lead to a 1.6% increase in the level of investment and a one percent decrease in the tariff rate will increase investment by 1.1%. Changing the initial values of these variables in the manner discussed above and using 1992 values for the other variables gives a value of \$6 Billion for U.S. investment to Mexico. This is a 140% increase over the 1992 value of \$2.5 Billion. This is the estimated level of U.S. investment when the NAFTA has taken full effect. It is a long run prediction of investment that enables one to make a dynamic estimate of the effect of the NAFTA.

The investment estimate enters into the CGE model as an increase in Mexico's capital stock. The larger capital stock adds to the impact of the NAFTA on Mexico's growth. Taking this additional growth into account before estimating the level of U.S. exports to Mexico is the heart of the dynamic estimate.

### C) THE DYNAMIC IMPACT

A CGE model is used to make a comparative static estimate of an economy's response to a policy change. This is done by introducing a policy shock to the model and allowing it to reach equilibrium. This will provide an estimate of how the producers and consumers in each sector change their behavior in response to the policy change.

This type of model is a system of supply and demand equations that simulates the working of a market economy.<sup>49</sup> The equations are solved simultaneously to find a vector of prices in which supply equals demand in all markets. The CGE model in this study was developed at the Economic Research Service (ERS), U.S. Department of Agriculture. The model follows the flow of income from producers to households through factor payments. It completes the circular flow by following the consumption patterns of the various economic agents.

The ERS model contains 11 sectors and is constructed to focus on international trade issues.<sup>50</sup> Each sector is linked through competition for intermediate goods and primary factors; land, labor, and capital. In the model it is assumed that there is a constant supply of production

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<sup>49</sup>"The Structure and Properties of the USDA/ERS Computable General Equilibrium (CGE) Model of the United States," Robinson, Kilkenney, and Hanson, 1990, p 2.

<sup>50</sup>"The Structure and Properties of the USDA/ERS Computable General Equilibrium (CGE) Model of the United States," Robinson, Kilkenney, and Hanson, 1990, p 2.



inputs. In order for one sector to increase production, it must bid the inputs away from the other sectors. This causes factor payments to increase when production expands.

To estimate the dynamic effects of the NAFTA, the predicted level of U.S. investment is entered into the CGE model as a change in Mexico's capital stock. Altering this value directly influences the production equations in the model. (See Figure 1) Enlarging capital stock increases the demand for the other production factors. As sectors expand, the payments to labor increase. As a result, household income goes up. As income rises, so does Mexican consumption of both domestic goods and imports.

The regression equation predicts U.S. investment to increase \$3.5 billion over the 1992 level. This increase is entered into the CGE model by increasing Mexico's capital stock by 35%. The change in capital stock is 35% because \$3.5 billion is 35% of the model's base level of Mexico's capital stock. Foreign investors have a choice of purchasing existing capital or supplying new capital to the market. The assumption is made that all of the new foreign investment is used to increase capital stock. This is not likely to be the case. Some of the foreign investment could go to purchasing productive capacity that already exists, and Mexico's capital stock may be increased by sources other than U.S. foreign investment. Still, foreign investment is the best proxy available because estimates of capital stock

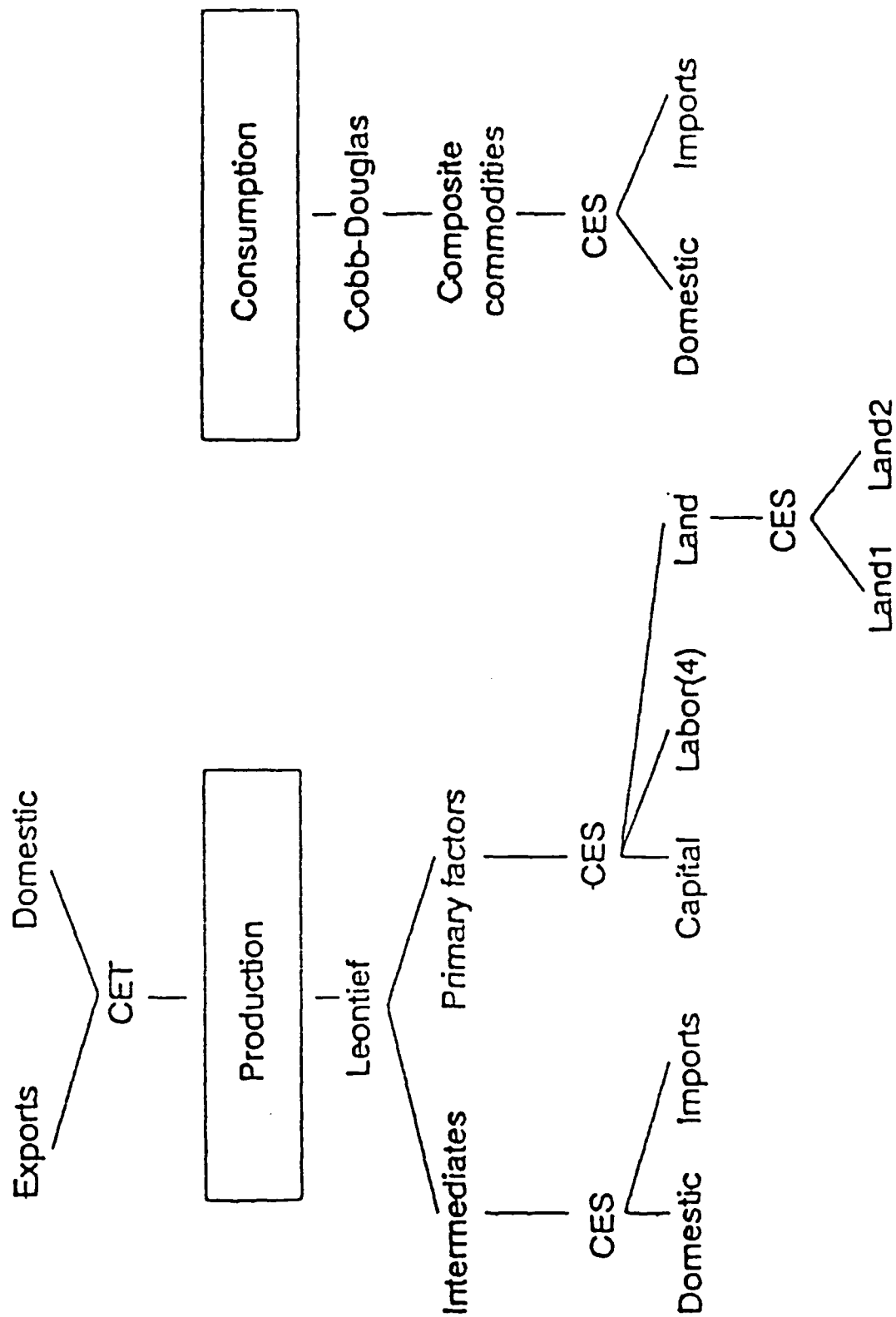


Figure 1. Model Summary

are virtually unobtainable for less developed countries.<sup>51</sup>

Two scenarios are considered to illustrate the long run benefits of the NAFTA on U.S. exports to Mexico. First, bilateral trade barriers are eliminated. This is accomplished by reducing Mexico's tariff rate to zero in the CGE model. This change shows an increase of U.S. exports to Mexico in 10 of the 11 sectors, but in all sectors, with the exception of corn, the increases were relatively minor.<sup>52</sup> (See Table Five.) In this case, U.S. exports of oil and refined fuels increase by \$128 million. This is a one percent increase over total U.S. exports in this sector in the base year.

This scenario is the static estimate. It reflects efficiency gains from trade based on comparative advantage. For example, the U.S. has better resources to produce corn, Mexico relies largely upon non-irrigated land for corn production. The level of U.S. exports of corn increases because of this advantage.

The change in U.S. exports is calculated without considering growth and changes in the Mexican economy. The majority of the previous work on the NAFTA has made this

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<sup>51</sup>"Private Investment and Democracy in Latin America," Manuel Pastor Jr. and Eric Hilt, Journal of World Development, vol. 21, 1993, p 493.

<sup>52</sup>The dramatic increase in corn exports reflects the low initial levels. Mexico imposed a 92% tariff equivalent of a quota on U.S. imports of corn in 1991.

TABLE FIVE - CGE RESULTS

<u>SECTOR</u>	<u>STATIC</u>		<u>DYNAMIC</u>	
	<u>%Change</u>	<u>Dollar Increase</u>	<u>%Change</u>	<u>Dollar Increase</u>
CORN	120%	\$238.8	285%	\$567.2
GRAINS AND WHEATS	36.5%	\$206.2	155%	\$875.75
FRUIT AND VEGATABLE	10.5%	\$2.0	71.9%	\$16.5
OTHER AGRICULTURE	6.78%	\$17.6	57.6%	\$149.2
FOOD	6.42%	\$57.5	43.7%	\$391.0
LIGHT MANUFACTURING	5.35%	\$41.0	40.5%	\$310.6
OIL	13.6%	\$126.0	44.7%	\$422.1
INTERMEDIATES	6.22%	\$159.0	27.5%	\$704.3
CONSUMER DURABLE GOODS	6.9%	\$136.9	17.64%	\$350.0
CAPITAL GOODS	6.73%	\$256.89	16.5%	\$680.2
SERVICES	-0.89%	-\$44.1	5.35%	\$269.1

Note: The percent increase in exports is over the base year 1989.

The dollar value increase is in millions of dollars. For example, the U.S. exports \$680.2 million of capital goods to Mexico in the dynamic estimate.

type of estimates.<sup>53</sup> In order to more accurately measure the changes in U.S. trade flows, the impact the NAFTA will have upon investment and Mexico's growth must be considered.

This is accomplished in the second estimate by increasing Mexico's capital stock as well as reducing the tariff level. In this case, the increase in U.S. exports to Mexico is much higher in each sector. The dynamic estimate shows a large increase in the agricultural sectors. For example, fruit and vegetable exports increase by \$16.5 million in the dynamic estimate compared to \$2 million increase in the static estimate. Oil and oil refining increases 44.7% to \$1.37 billion when Mexico's capital stock is increased compared. The sectors showing the largest dollar value increase are intermediate goods, \$704.3 million, and capital goods, \$680 million. As was anticipated, growth of the Mexican economy has a large impact on U.S. trade with Mexico. The dynamic estimate provides a more comprehensive picture of the eventual gains the NAFTA will provide to the U.S.

This estimate also allows inference as to which sectors of the Mexican economy are experiencing the most growth. As Mexico's total capital stock increases, the capital stock in each sector will change as well. The sectors experiencing the greatest increase in U.S. exports will undergo the least

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<sup>53</sup>For example see Koechlin, et al. (1991), Globberman (1992), and Adams and Beltran del Rio (1991).

amount of growth. It is possible that these sectors could actually contract. An example would be corn production. The dynamic scenario estimates an increase in U.S. corn exports of 285%. Mexico importing this much corn from the U.S. will lead to a reduction in domestic production. The inference can be made that the increasing capital stock does not enter into the corn sector. On the other hand, sectors such as durable goods and services, which experience much smaller increases in exports, will attract a substantial amount of the new capital.

While the increase in U.S. exports is very large. One must keep in mind the relative sizes of the economies. The Mexico's GDP is currently about 4% the size of the United States'. This is important, because when discussing large changes to the Mexican economy, one must realize that these same changes have a minor impact on the U.S. For example, this model predicts large increases in U.S. exports to Mexico. In 1991, 8.9% of total U.S. exports went to Mexico. This reflects the diverse market for U.S. products worldwide. While the U.S. does benefit from the increased trade with Mexico, the gains will not be as large as they initially appear.

A major shortcoming of this model is that it does not describe the path taken to get to the final equilibrium values. The CGE model will calculate the trade levels between the U.S. and Mexico with trade liberalization and an

increase in Mexico's capital stock. It will not, however, describe the transition path of the markets. This is an important factor to consider, but this method of modeling can not offer any insight into this path because dynamic decision-making requires a very complex series of equations

Another shortcoming of the model is that it does not account for the technology transfer that is expected with an increase in capital flows. When a developed country, like the U.S., invests heavily into a lesser developed country, like Mexico, one would expect large technology transfers. The technology transfer can be seen in the increase in the capital goods and services sectors. The increase in these sectors will introduce new capital, human and production, to Mexico's economy. The CGE model, however, assumes that technology remains constant. Since the model makes this assumption, it does not account for "modern" capital. This type of capital will have an exponential impact on Mexico's production. The model assumes all capital has a linear impact on Mexico's production; therefore it understates the actual increase in Mexico's capital stock.

#### V) CONCLUSION

The NAFTA will be beneficial to both the United States and Mexico. Mexico will profit from an increase in U.S. foreign investment. This will enable the Mexican Government to continue reprivatizing their industries while maintaining

strong growth rates. Mexico stands to gain from large influx of capital from the U.S. Once the agreement is fully implemented, annual U.S. investment to Mexico will increase \$3.5 billion. The new capital will continue to support strong growth in the Mexican economy while allowing for reprivatization.

The U.S. will profit from increased exports to Mexico. While initially the gains to the U.S. will be small, as the Mexican economy grows, the U.S. will experience larger gains. Presently, the Mexican economy is heavily dependent upon the U.S. While the Mexican economy is small, this does not greatly impact the U.S. If Mexico receives \$3.5 billion of additional investment annually, it will not remain a small economy. As Mexico grows, they will become a more important trading partner for the U.S. A 35% increase in Mexico's capital stock leads to large increase in U.S. exports. If Mexico's capital stock were to double or triple, U.S. exports would increase drastically. This would have a large positive impact on the U.S. economy.



APPENDIX ONE - DATA SOURCES

<u>VARIABLE</u>	<u>SOURCE</u>	<u>PUBLISHER</u>
U.S. FDI	Survey of Current Business	Bureau of Economic Analysis
Per Capita GDP	International Financial Statistics	International Monetary Fund
Index of Wage Rate	International Financial Statistics	International Monetary Fund
Mexico's Tax on Production	Segundo Informe de Gobierno (1990)	Estados Unidos Mexicanos
Mexico's Tariff Rate	"Mexico-Country Marketing Plan"	National Trade Data Bank (various years)
Value Added	Segundo Informe de Gobierno	Estados Unidos Mexicanos
Nominal Interest Rate	World Tables	World Bank
BERI Index	Business Environment Risk Index	BERI, SA Research Institute

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